IN THE CLAIMS

Please Cancel Claims 20-51, make the following Amendments in Claims 1-19 and provide Notice of Allowance and Issue Fee Due.

1. (currently amended): A material system investigating system comprising a source of electromagnetic radiation, a means for supporting a sample system, and a detector, such that in use a beam of electromagnetic radiation is provided by said source of electromagnetic radiation and is caused to reflect from a sample system placed on said means for supporting a sample system and enter said detector, said material system investigating system further comprising at least one electromagnetic beam intercepting angle-of-incidence changing system comprising elements which are easily functionally entered into the locus of the electromagnetic beam on both sides of said sample system, which at least one electromagnetic beam intercepting angle-of-incidence changing system serves to direct said electromagnetic beam onto substantially the same spot on the sample system as is the case where the said at least one electromagnetic beam intercepting angle-of-incidence changing system is not functionally present, but at an angle-of-incidence which is different than that when said at least one electromagnetic beam intercepting angle-of-incidence changing system is not functionally present, said at least one electromagnetic beam intercepting angle-of-incidence changing system not effecting, or requiring change of, the locus of the electromagnetic beams outside said at least one electromagnetic beam intercepting angle-of-incidence changing system, on either side of said means for supporting a sample system, hence does not require said material system investigating system to comprise multiple sources and[[/or]] detectors or the change of position of <u>at least one selection from the group consisting of:</u>

~~the~~ said source of electromagnetic radiation; and[[/or]] said detector thereof;

to effect change said angle-of-incidence.

2. (original): A material system investigating system as in Claim 1, in which said at least one electromagnetic beam intercepting angle-of-incidence changing system comprises, on each side of said means for supporting a sample system, at least one selection from the groups consisting of:

multiple angle prism(s); and
a system of mirrors;

said at least one electromagnetic beam intercepting angle-of-incidence changing system being slidably mounted to a guide element such that the functional presence thereof in the pathway of the locus of the electromagnetic beams on both sides of said means for supporting a sample system is effected by physical sliding motion of said at least one electromagnetic beam intercepting angle-of-incidence changing system along said guide element.

3. (original): A material system investigating system as in Claim 1, in which said at least one electromagnetic beam intercepting angle-of-incidence changing system comprises a first multiangle prism on the incident side of said means for supporting a sample system and a second multiangle prism thereafter, said first and second multiangle prisms each having a first and a second side, each said multiangle prism presenting with first and second inner surfaces associated with said first and second sides, respectively, the first and second side of each multiangle prism having means for changing the properties of

inner surface thereof from essentially transmissive to essentially reflective, each said multiangle prism being oriented such that an electromagnetic beam entering thereinto encounters the first or second inner surface thereof and either passes therethrough and progresses on to contact a sample system placed on said means for supporting a sample system, or reflects from said first or second inner surface thereof and then from said second or first inner surface thereof, respectively, and then progresses on to contact a sample system placed on said means for supporting a sample system.

4. (currently amended): A material system investigating system as in Claim 3, which further comprises at least one shutter door which can be opened to let the electromagnetic beam pass, or closed to block its passage, said at least one shutter door being positioned in the electromagnetic beam locus selected from the group consisting of:

defined by passage through said first or second side of said first multiangle prism; and

defined by reflection from said first or second side of said first multiangle prism;

said at least one shutter door being positioned between <u>at least one selection from the group consisting of:</u>

~~the~~ <u>said</u> first multiangle prism and the means for supporting a sample system<u>;</u> and[[/or]]

~~between~~ said means for supporting a sample system and said second multiangle prism.

5. (original): A material system investigating system as in

Claim 1, in which said at least one electromagnetic beam intercepting angle-of-incidence changing system comprises, on first and second sides of said means for supporting a sample system, first and second beam splitters, respectively, which first and second beam splitters each pass approximately half, and reflect approximately half of a beam of electromagnetic radiation caused to be incident thereupon at an oblique angle to a surface thereof; said at least one electromagnetic beam intercepting angle-of-incidence changing system further comprising a first reflective means positioned to intercept the approximately half of the electromagnetic beam which reflects from said first beam splitter on the incident side of said means for supporting a sample system and direct it toward said means for supporting a sample system; and also further comprising a second reflective means positioned after said means for supporting a sample system to intercept an electromagnetic beam which reflects from a sample system placed on said means for supporting a sample system and direct it toward the second beam splitter;

said material system investigating system further comprising at least one shutter door which can be opened to let the electromagnetic beam pass, or closed to block its passage, said at least one shutter door being positioned in the pathway of the electromagnetic beam between which progresses along a locus selected from the group consisting of:

defined by passage through said first beam splitter; and
defined by reflection from said first beam splitter;

on either side of said means for supporting a sample system.

6. (original): A material system investigating system as in Claim 1 or 2 or 3 or 4 or 5 which is a system selected from the group consisting of:

ellipsometer;
polarimeter;
reflectometer; and
spectrophotometer;

operating in at least one wavelength range selected from the group consisting of:

VUV;
UV;
Visible;
Infrared;
Far Infrared;
Radio Wave;

and is applied in a setting selected from the group consisting of:

in-situ; and
ex-situ.

7. (original): A material system investigating system as in Claim 1 or 2 or 3 or 4 or 5 in which said material system investigating system is mounted to an X-Y-Z position control system, and which is oriented to investigate a surface of a sample system oriented in a horizontal or vertical or a plane thereinbetween.

8. (original): A material system investigating system as in Claim 1, which includes at least two multiple angle prisms, one being present on one side of said sample system, and the other thereof being present on the other side of said sample system.

9. (original): A material system investigating system as in Claim 1, which includes lenses positioned to focus a beam of electromagnetic radiation onto a sample system.

10. (original): A material system investigating system as in Claim 1, which includes means for adjusting the orientation of at least one electromagnetic beam intercepting angle-of-incidence changing system, optionally in simultaneous combination which includes lenses positioned to focus a beam of electromagnetic radiation onto a sample system and recollimate the beam of electromagnetic radiation which reflects from said sample system.

11. (currently amended): A material system investigating system as in Claim 1, in which the at least one electromagnetic beam intercepting angle-of-incidence changing system comprises, on at least one side selected from the group consisting of:

said first and[[/or]];
said second;

sides of said means for supporting a sample system, at least one system of mirrors, said at least one system of mirrors being comprised of:

a means for changing the propagation direction of an initial beam of electromagnetic radiation without significantly changing the phase angle between orthogonal components thereof, said means comprising two pairs of reflecting mirrors oriented so that said initial beam of electromagnetic radiation reflects from a first reflecting means in the first pair of reflecting means to a second reflecting means in said first pair of reflecting means, in a first plane; and such that the beam of electromagnetic radiation which reflects from the second reflecting means in said first pair of reflecting means reflects from the first reflecting

means in said second pair of reflecting means to said second reflecting means in said second pair of reflecting means, in a second plane which is essentially orthogonal to said first plane; such that the direction of propagation of the beam of electromagnetic radiation reflected from the second reflecting means in said second pair of reflecting means is different from the propagation direction of the initial beam of electromagnetic radiation; the basis of operation being that changes entered between the orthogonal components by the first pair of reflective means is canceled by that entered by the second pair of reflective means.

12. (currently amended): A method of calibrating a material system investigation system comprising the steps of:

a. providing a material system investigation system comprising a source of a polychromatic beam of electromagnetic radiation, a polarizer, a stage for supporting a sample system, an analyzer, a dispersive optics and at least one detector system which contains a multiplicity of detector elements, said material system investigation system optionally comprising at least one compensator(s) positioned at a location selected from the group consisting of:

before said stage for supporting a sample system[[,]]; and

after said stage for supporting a sample system[[,]]; and

both before and after said stage for supporting a sample system;

such that when said material system investigation system is used to investigate a sample system present on said stage for supporting a sample system, at least one selection from the group

consisting of:

said analyzer;
said polarizer; and
at least one of said at least one compensator(s);

is/are caused to continuously rotate while a polychromatic beam of electromagnetic radiation produced by said source of a polychromatic beam of electromagnetic radiation is caused to pass through said polarizer and said compensator(s), said polychromatic beam of electromagnetic radiation being also caused to interact with said sample system, pass through said analyzer and interact with said dispersive optics such that a multiplicity of essentially single wavelengths are caused to simultaneously enter a corresponding multiplicity of detector elements in said at least one detector system;

said material system investigating system further comprising at least one angle-of-incidence changing system which is easily functionally entered into the locus of the electromagnetic beam on both sides of said means for supporting a sample system, which at least one angle-of-incidence changing system serves to direct said electromagnetic beam onto substantially the same spot on the sample system as is the case where the said at least one angle-of-incidence changing system is not present, but at an angle-of-incidence which is different when said at least one angle-of-incidence changing system is and is not functionally present, said at least one angle-of-incidence changing system not effecting, or requiring change of, the locus of the electromagnetic beams outside said at least one angle-of-incidence changing system, on either side of said means for supporting a sample system, hence does not require multiple sources and[[/or]] detectors or change of position of <u>at least</u>

one selection from the group consisting of:

the said source of electromagnetic radiation; and[[/or]] said detector thereof;

to effect change said angle-of-incidence;

b. along with step a., developing a mathematical model of said material system investigation system which comprises as calibration parameter variables selections from the group consisting of:

polarizer azimuthal angle orientation;
present sample system PSI;
present sample system DELTA;
compensator azimuthal angle orientation(s);
matrix components of said compensator(s); and
analyzer azimuthal angle orientation;
angle-of-incidence changing system representation;

which mathematical model is effectively a transfer function which enables calculation of electromagnetic beam intensity as a function of wavelength detected by a detector element, given intensity as a function of wavelength provided by said source of a polychromatic beam of electromagnetic radiation;

c. causing a polychromatic beam of electromagnetic radiation produced by said source of a polychromatic beam of electromagnetic radiation, to pass through said polarizer, interact with a sample system caused to be in the path thereof, pass through said analyzer, and interact with said dispersive optics such that a multiplicity of essentially single wavelengths are caused to simultaneously enter a corresponding multiplicity

of detector elements in said at least one detector system, with said polychromatic beam of electromagnetic radiation also being caused to pass through present compensator(s);

d. obtaining an at least two dimensional data set of intensity values vs. wavelength and a parameter selected from the group consisting of:

angle-of-incidence of said polychromatic beam of electromagnetic radiation with respect to a present sample system, and

azimuthal angle rotation of at least one element selected from the group consisting of:

said polarizer; and
said analyzer;
at least one of said at least one compensator(s);

while at least one selection from the group consisting of

said polarizer; and
said analyzer;
at least one of said at least one compensator(s);

is caused to continuously rotate;

e. performing a mathematical regression of said mathematical model onto said at least two dimensional data set, thereby evaluating calibration parameters in said mathematical model;

said regression based calibration procedure evaluated calibration parameters serving to compensate said mathematical model for non-achromatic characteristics and non-idealities of said

compensator(s), and for azimuthal angles of said polarizer, analyzer and compensator(s) and for said angle-of-incidence changing system.

13. (original): A method of calibrating a material system investigation system investigation system as in Claim 12 which further comprises including at least one selection from the group consisting of:

calibration parameters for detector element image persistence; and
read-out nonidealities in the mathematical model;

and further evaluating said calibration parameters for detector element image persistence and read-out nonidealities in said regression procedure.

14. (original): A method of calibrating a material system investigation system as in Claim 12 in which the step of developing a calibration parameter containing mathematical model thereof includes the steps of providing a matrix representation of each of said polarizer, present sample system, said compensator(s), and said analyzer, and determining a mathematical transfer function relating electromagnetic beam intensity out to intensity in, as a function of wavelength, by multiplication of said matrices in a spectroscopic rotating element material system investigation system element presence representing order.

15. (original): A method of calibrating a material system investigation system as in Claim 12, which further comprises the step of parameterizing calibration parameters by representing variation as a function of at least one member of the group consisting of:

wavelength;
angle-of-incidence of said polychromatic beam of electromagnetic radiation with respect to a present sample system,
sample system characterizing parameters; and

azimuthal angle orientation of one element selected from the group consisting of:

said polarizer; and
said analyzer;

by a parameter containing mathematical equation, said parameters being evaluated during said mathematical regression.

16. (original): A method of calibrating a material system investigation system as in Claim 15, in which calibration parameters which are parameterized are selected from the group consisting of:

polarizer azimuthal angle orientation;
compensator azimuthal angle orientation(s);
matrix components of said compensator(s), and
analyzer azimuthal angle orientation;

each as a function of wavelength.

17. (original): A method of calibrating a material system investigation system as in Claim 12 in which the sample system is selected from the group consisting of:

open atmosphere with the spectroscopic rotating compensator material system investigation system being

oriented in a "straight-through" configuration; and

other than open atmosphere with the spectroscopic rotating compensator material system investigation system being oriented in a "sample-present" configuration.

18. (currently amended): [[An]] A sample system investigation system for application in investigating a sample system with electromagnetic radiation, sequentially comprising:

a. a source of a beam electromagnetic radiation;

b. a polarizer element;

c. optionally a compensator element;

d. additional element(s);

e. a sample system;

f. additional element(s);

g. optionally a compensator element;

h. an Analyzer element; and

i. a Detector System;

wherein said additional component(s) in d. and f. each comprise at least one electromagnetic beam intercepting angle-of-incidence changing system element which can be easily entered into the

locus of the electromagnetic beam on both sides of said sample system, which at least one electromagnetic beam intercepting angle-of-incidence changing system elements serves to direct said electromagnetic beam onto substantially the same spot on the sample system as is the case where the said at least one electromagnetic beam intercepting angle-of-incidence changing system elements are not present, but at an angle-of-incidence which is different than that when said at least one electromagnetic beam intercepting angle-of-incidence changing system is not present, said at least one electromagnetic beam intercepting angle-of-incidence changing system elements not effecting, or requiring change of, the locus of the electromagnetic beams outside said at least one electromagnetic beam intercepting angle-of-incidence changing system elements, on either side thereof, hence does not require multiple sources and[[/or]] detectors or change of position of <u>at least one selection from the group consisting of:</u>

~~the~~ <u>said</u> source of electromagnetic radiation<u>;</u> and[[/or]] <u>said</u> detector <u>thereof;</u>

to effect change said angle-of-incidence.

19. (currently amended): [[An]] <u>A</u> sample system investigation system for application in investigating a sample system with electromagnetic radiation as in Claim 18, in which each electromagnetic beam intercepting angle-of-incidence changing system is a selection from the group consisting of:

multiangle prisms; and
a plurality of mirrors.

20 - 51 (canceled).

It is now believed that the Claims 1 - 19 are in order for Issue. The Examiner is therefore respectfully requested to provide the Notice of Allowance and Issue Fee Due. Should problems remain, please contaact Attorney Welch, who is receptive to Examiner Amendment.

Sincerely,

JAMES D. WELCH
JW/hs